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DEVELOPING A STATE SOLID WASTE MANAGEMENT PLAN

Richard O. Toftner

Bureau of Solid Waste Management
Cincinnati, Ohio

1970

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D E V E L O P I N G

A STATE SOLID WASTE MANAGEMENT PLAN

This publication (SW-42ts) was written by

RICHARD O. TOFTNER

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FOREWORD

THIS DOCUMENT (SW-42ts) describes basic features of the planning process and their utilization in the development of a State plan for its solid waste management. Purpose of the publication is to aid States in preparing comprehensive solid waste management plans. Intended for use by any State solid waste agency, the publication's specific applicability to any one unique situation is not necessarily assured; they are flexible enough, however, to serve every State in accordance with its own needs and special conditions.

Developing State plans for solid waste management should include the following objectives: (1) adoption of a sound planning process; (2) furtherance of intergovernmental coordination; (3) application to solid waste management of techniques and knowledge from the best of organizational theory, financial management, cost control, and the management sciences in general; (4) integration of the solid waste plan with comprehensive State or areawide plans; (5) development of sound action programs with the greatest promise for ultimate solution of solid waste problems.

--RICHARD D. VAUGHAN, *Director*
Bureau of Solid Waste Management

PREFACE

THIS DOCUMENT was prepared under the direction of Leander B. Lovell, Chief, Systems Management Branch, Division of Technical Operations, Bureau of Solid Waste Management. Work on guidelines for solid waste planning was initiated by M. DeVon Bogue, Solid Waste Management Representative, Region IV, Atlanta, Georgia, and by Lee F. Hultgren, former planner-engineer in the planning section of the Division of Technical Operations in the Bureau of Solid Waste Management.

Grateful acknowledgment is given to members of an ad hoc panel, who, from November 1968 through March 1969, contributed much time, effort, and experience in reviewing preliminary and revised drafts on this publication. Members of the ad hoc panel were: Donald R. Andres, Senior Sanitary Engineer, Bureau of Vector Control & Solid Waste Management, California Department of Public Health; James Austin, Director, Urban Information and Technical Assistance, Georgia Municipal Association; Paul Baldridge, Director of Planning, Ohio Department of Development; Andy D. Briscoe, Director, Public Works, City of Boulder, Colorado; O. William Caddy, Planning Analyst, Solid Wastes Program, Pennsylvania Department of Health; Floyd Forsberg, Project Director, Solid Wastes Program, Minnesota State Pollution Control Board; Herman Groseclose, Senior Engineer, Solid Wastes Program, Oklahoma State Department of

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Health; Fred Kellow, Project Director, Solid Wastes Program, Michigan Department of Public Health; Charles Kurker, Project Director, Solid Wastes Program, Connecticut State Department of Health; O. R. Lyons, Project Director, Solid Wastes Program, West Virginia State Department of Health; Roland J. Mross, Director of Planning, Division of Planning, State of Indiana; Robert Nethercut, Director, Community Services, Metropolitan Council, St. Paul, Minnesota; John R. Sheaffer, Center for Urban Studies, University of Chicago, Chicago, Illinois; William Wilkie, Project Director, Solid Wastes Program, New York State Department of Health.

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D E V E L O P I N G

A STATE SOLID WASTE MANAGEMENT PLAN

PART ONE: THE PLANNING PROCESS

Definition

Planning is the conscious process for achieving future objectives with rational and full consideration of any likely contingencies and alternatives. A plan should guide intended action specifying the time and priorities for accomplishing this intended action. The planning process is a systematic method of: (1) recognizing that a general situation or problem exists; (2) collecting and analyzing data about this general situation or problem; (3) redefining the situation or problem in light of the analyzed data; (4) establishing objectives, the accomplishment of which will serve to change the situation or correct the problem; (5) predetermining methods, timing, and priorities for achieving objectives; (6) evaluation of the predetermined methods in light of their success or failure in achieving objectives and modification of the plan to meet changing conditions.

In requiring a systematic approach for achieving objectives, planning for solid waste management at the State, regional, and local levels is similar to planning for any activity. Although a plan can and should be revised while underway to accommodate changing situations,

it should be formalized for continuing reference. A State plan for solid waste management, therefore, should be a written document outlining the activities that the State intends to undertake during the life-span of the plan. Moreover, it should be both a technical and policy statement containing objectives for solution of solid waste management problems, coupled with a set of directions for achieving those objectives. This statement should then be framed within a time context and order of priorities.

Application

The State plan for solid waste management should adequately serve three functions: (1) provide an internal technical and policy guideline for carrying out the purposes of the State solid waste management agency; (2) provide a State-directed framework of standards for local and regional solid waste management planning and implementation; (3) provide a legislative support document for furthering the improved management of solid wastes in the State.

Coordination

The essence of planning is coordination. Planning requires resolution of conflicting interests, allocation of available funds and other resources, intergovernmental and interdepartmental cooperation, and establishment of priorities. From the standpoint of the direction and overall needs of State government, a solid waste management plan is one among several functional plans, such as those dealing with highways, natural resources, education, health, law enforcement, and recreation. State solid waste

management plans, therefore, should relate to, and not conflict with, other plans of the State. It is essential that State, regional, and local solid waste management planning be included in the overall plan of the jurisdiction that will ultimately implement it. In this way the solid waste management agency will be able to compete effectively for funds, personnel, and other resources and facility sites.

Basic Planning Model

The procedure for developing a State plan for solid waste management can be explained by structuring the various steps normally taken in formulation of a plan and can be shown in a simple 8-step model (Figure 1). The planning process is not static, as it may appear on paper, but dynamic and continuous. The various steps in the planning process should also be considered as capable of occurring simultaneously although in preparing the written plan report some States may prefer to consider each phase in sequence. Each step could, in fact, serve as a separate chapter or section of a State plan report. A planning model should provide feedback into the system from various planning process events as these occur (Figure 1). The model itself has built-in controls to allow for correction of errors discovered through feedback relationships. Developments outside the planning process also cause corrections or revisions. Social, legal, and environmental changes can affect the plan and need to be considered.

Initial Planning

Awareness or recognition of a situation is the first step in the planning process and is the catalyst that results in the second action:

BASIC PLANNING MODEL

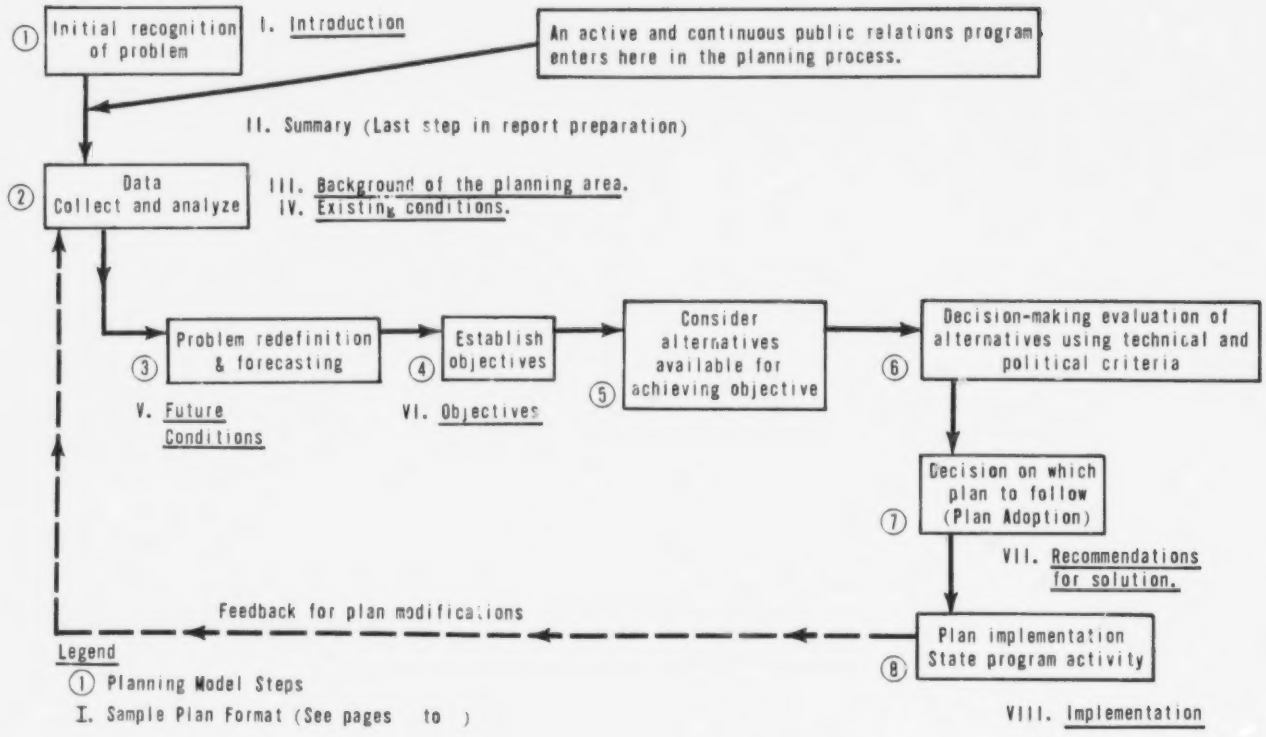
① Initial recognition of problem
I. Introduction
An active and continuous public relations program enters here in the planning process.
II. Summary (Last step in report preparation)
② Data Collect and analyze
III. Background of the planning area.
IV. Existing conditions.
③ Problem redefinition & forecasting
V. Future Conditions
④ Establish objectives
VI. Objectives
⑤ Consider alternatives available for achieving objective
⑥ Decision-making evaluation of alternatives using technical and political criteria
⑦ Decision on which plan to follow (Plan Adoption)
VII. Recommendations for solution.
Feedback for plan modifications
⑧ Plan implementation State program activity
VIII. Implementation
Legend
① Planning Model Steps
I. Sample Plan Format (See pages to)

Figure 1. The first step (1) in the planning process is awareness that a problem exists and needs to be solved. The second step (2) is to collect and analyze data relating to the problem. Such ana'ysis makes possible a redefinition of the problem and a forecasting of future situations (3). Problem definition for both the present and future situation helps to suggest objectives (4) that if achieved would serve to solve the problems. Two or more alternatives (5) might be available for solving the problem and achieving objectives. The feasible alternative or alternatives (6) are selected by considering technical, political, social and other factors. Once this decision has been made a plan for solution of the problems (7) can be adopted. Actual action for carrying out the plan (8) then follows. Effectiveness of the plan is measured during its implementation. This data is fed back into the continuing planning process to guide plan modifications if needed.

data collection and analysis. The data and their analysis will provide the basic facts without which planning is impossible. Analysis of data will also point up problem areas and situations requiring solution in the plan (Figure 1, steps 1 and 2).

Problem Redefinition

As indicated by analysis of the data the next step is redefinition of the problem and identification of such problems and conditions that will be relevant in the future. This requires forecasting (Figure 1, step 3).

Objectives and Consideration of Alternative Actions

Enough is now known about the problem that specific objectives may be set and alternate methods for achieving these may be suggested (Figure 1, steps 3 and 4). The State solid waste management agency is saying: What situation should be changed and which problems corrected? Where should modifications be made? Several alternatives might be available to achieve objectives.

Emerging Alternatives and Decisions

Which alternative or alternatives should the State select to accomplish the objectives set forth to solve its solid waste management problems? The answer to this question will help establish the program priorities. These decisions are subject to all sorts of influences that must be considered when developing the State solid waste management plan (Figure 1, steps 5 and 6). Such influences include political,

legal, social, and financial factors, and available technology. Basic among these are political and technical influences. Because of the technical nature of the decisions, a specialized interdisciplinary staff, the one that has been developing the plan to this point, should continue to play a role in supplying information and expert evaluation of alternative solutions and in implementing the plan. Evaluation of existing State, regional, or local plans is an important part of this step. Solid waste management plans should be compatible with existing plans, assuming such plans take solid waste needs into account. Therefore, decision-making for the State solid waste management plan will be based to some extent upon political exigencies, specialized technical analysis, and existing plans.

Those alternative solutions which appear feasible on the basis of such consideration should be submitted to the appointed and elected public officials and the public itself for review and possible adoption, but not without adequate preparation for such a step. This means a program of education of officials and the public--a vital and integral part of the entire planning process. The agency conducting the planning should have initiated an information and education program early in the plan formulation stages, and the public information plan should continue through implementation of the entire plan. News releases, films, articles, and speakers, for example, can help develop public awareness and aid in approval of solid waste management plans and programs.

Plan Establishment

Once the decision-making stage has been completed, decisions should be translated into the recommendations and priorities that form the core

of the plan (Figure 1, step 7). Although, at this point, a State plan for solid waste management has emerged, the planning process has not been completed. Planning will be continuous and proceed concurrently with implementation of previously planned proposals (Figure 1, step 8). Original plans will need reevaluation and modification to accommodate changing situations. Earlier forecasts will require revision. This evaluation and modification will provide new information and along with the results of implementing the plan will be fed back into the planning process, as indicated in the model.

PART TWO: PLAN REPORT OUTLINE

Brief Guide

The basic planning model (Figure 1) can be translated into an outline for reporting the established plan. Such a format communicates the logic inherent in the planning procedure. Planning initiative and innovation are desirable, however, and each State is expected to formulate its own systematic outline and report, taking into account its particular needs. The text in Part Three explains in detail the elements that would be contained in a plan report conforming to this outline.

SAMPLE FORMAT FOR REPORTING THE PLAN

Corresponding steps in the model	Elements of the Report
1	Foreword or Preface (or both)
	Table of Contents
	Section I Introduction Purposes of the plan.
	Section II Summary (Note: This section should be the last section prepared in the plan report and may come at the end of the report, if desired.)

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Corresponding steps in the model	Elements of the Report
2	Section III Background of the Planning Area
	*1. Jurisdictions
	*a. State
	b. Regions
	c. Planning areas
	d. Metropolitan areas
	e. Council of Governments (COG's) jurisdictions
	f. Counties
	g. Municipalities
	h. Special districts
	i. Other
	2. Physical Conditions
	a. Environmental conditions
	b. Geology and soils
	c. Climatology
	d. Drainage basins
	e. Other
2	Section IV Existing Conditions
	1. Arrange data according to specific needs of the planning agency. Data collected for the *1968 National Survey of Community Solid Waste Practices* is the basic source for this plan section. But such data would have to be augmented by other types of information.
	2. Describe and analyze all existing conditions affecting management of municipal, industrial, agricultural, and mineral wastes, etc.
	a. Storage, collection, and transportation practices
	b. Disposal and reduction facilities
	c. Quantities of wastes collected, disposed of, and generated, with generation rates
	d. General management practices (e.g., utilization of manpower and equipment)

*Arabic enumerated and alphabetized items illustrate sample subject matters.

Corresponding steps in the model	Elements of the Report

e. Population (size and densities)
f. Housing (types and locations)
g. Land uses (residential, commercial, industrial, agricultural, extractive, recreational, and other relevant land uses)
h. Transportation corridors
i. Levels of acceptability, service costs, and other relevant State, regional, and community conditions
j. Public awareness and knowledge about solid waste problems and service requirements
k. Expenditures for solid waste management
l. Tax base (assessed valuations)
m. Tax rates
n. Public finance practices
o. Status of legislation
p. Economic base
q. Other

3 — Section V — Future Conditions and Problem Definition

1. Relevancy for the future (from the analysis of the data of existing conditions accumulated in sections III and IV, determine which conditions will have a bearing on the future).

2. Future problems defined

a. Types
b. Locations
c. Extent
d. Persistence
e. Control difficulties
f. Other

3. All existing conditions and problems bearing upon the future should be forecast at this stage.

4, 5, & 6 — Section VI — Objectives

Objectives should be clearly stated and based upon need to solve problems defined earlier. A State might specify any of the following objectives to solve its solid wastes problems:

Corresponding steps in the model	Elements of the Report
	1. Acceptable methods of controlling improper waste disposal
	2. Acceptable collection and transportation methods
	3. Development of better trained solid waste management personnel (operating and management levels)
	4. Better informed public regarding solid waste problems and service requirements
	5. Provision of sufficient financial support for solid waste management
	6. Development of solid waste management organizational structure
	7. Other
7 & 8	Section VII Recommendations for Solution (The Plan)

1. This section should specify what the State intends to accomplish in order to solve its solid waste management problems. It should include designation of the following:

   a. Timing and priorities of intended action (consider short- and long-term objectives)
   b. Location of intended action
   c. Who should act (i.e., agency, department)
   d. Estimated costs
   e. Problems that will be solved
   f. Other

2. It is suggested that the following aspects be considered as intended plan action. Proposals for this action should be accompanied by procedures for accomplishment and a schedule of initiation of this action.

Corresponding steps in the model	Elements of the Report

a. Legislation, rules, and regulations
b. Inspection and enforcement
c. Licensing of facilities
d. Training programs
e. Technical assistance to operating units
f. Certification of operating personnel
g. Public information and education program
h. Development of budgeting procedures, financing, cost-effectiveness, special charge features, and other operating management features
i. Development of solid waste management operating departments and jurisdictions
j. Recruitment, selection, and hiring of solid waste management operating personnel
k. Other

Section VIII Implementation (occurs outside the plan document but is guided by it)

Appendices

This section of the report should include supporting materials and information used to develop the analyses, objectives, and plan. Content of this section might include:

a. Charts
b. Additional tables
c. References
d. Legislation and regulations
e. Definition of terms
f. Methodologies of research and analyses
g. Other

PART THREE: PLAN REPORT PREPARATION

Much of the material presented in the foregoing outline is self-explanatory. The content of the foreword or preface, the table of contents, and the introduction will largely be suggested by the subject matter included in the plan text. Thus, these guidelines will not dwell on those aspects. Explanation will begin with Section II of the outline, the summary, and proceed through the appendices.

Summary (Section II)

By summarizing the findings and recommendations for quick reference, the plan report can be made more useful as a working document. This summary is usually placed at the beginning of the report and should note the pertinent page, paragraph, table, or appendix as the appropriate reference for any summarized information. Furthermore, a good summary section can be excerpted in its entirety from the plan report, separately reproduced, and used for public information purposes. A special condensation of the summary can be made into public relations materials to gain citizen support.

Background of the Planning Area and Existing Conditions (Sections III and IV)

The third and fourth sections of the plan document provide the framework for planning and an appraisal of the existing situation. In

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the planning process this is characterized by collection of data, an essential part of the planning process (Figure 1, step 2). Without data it would be futile to attempt to forecast, determine needs, or set objectives. Data and information will be diverse, of varying quantity and quality, and only some will be useful for developing a State plan for solid waste management. In developing its plan, each State should be selective in its data. Data collected by the State for the *National Survey of Community Solid Waste Practices* will be one of the important sources of information. This source will provide much data about solid waste handling practices and facilities in communities throughout the State, including information on solid waste storage, collection, reduction, and disposal methods related to particular areas, types and locations of disposal and reduction facilities, budgets for solid waste management, population, zoning, and other community information. This information can be retrieved and analyzed for planning on a local, regional, State, or national basis. More detailed and precise data than that provided in the National Survey, however, is required to plan for action programs. It is essential that information about all solid waste sources and supporting management systems be gathered to build the needed data base. Additional data about community planning and development has become available in recent years. For more detailed solid waste management planning, these sources should be tapped for data on land uses, economics, population, and the physiography of planning areas. The degree of State involvement in, or control over, solid waste sites, facilities, and operations will determine whether a

State should concern itself with these types of data in its planning. This detailed data is, however, essential for local and regional planning. A discussion of this aspect of planning is included for those States and interstate agencies which have a responsibility for developing local and regional solid waste management plans. Moreover, appropriate State responsibility for community solid waste practices requires that States know about such information.

Population. Determination of past, current, and future population of a jurisdiction is an important planning consideration. When related to solid waste generation rates, land uses, employment centers, and other data, population information can help determine sources of solid wastes, equipment needs, capacities and locations of reduction and disposal facilities. Aspects of population which should be considered include: total size (past, current, future), family size, age distribution, densities (by either planning area, enumeration district, or census tract), and growth rates.

A good deal of population data will be available in tabulated and analyzed form from planning com 'ssions, economic development commissions, and chambers of commerce. If the data are not available from these sources, U.S. Census publications contain considerable population data which, however, will require organization and analysis.

Physical Conditions (Man-made and Natural). In locational analysis for determining actual or potential solid waste reduction and disposal sites, consideration should be given to physical and natural conditions. Some data which sh uld be collected and analyzed include: topographic

features; general soils; groundwater, flood areas; oil, gas, and coal resources; clay, shale, and rock deposits; timber; local climatology.

If these data are not already available from local, regional, or State planning agencies the following sources can in most cases provide the information: U.S. Geological Survey, U.S. Department of Agriculture, U.S. Weather Bureau (ESSA), universities, State Geological Survey, and State Natural Resources Departments. Consideration should be given to the suitability of existing regional government configurations for operation of solid waste management systems within their territories. Planning should include proposals that suggest possible combinations of governmental units into regional solid waste management systems.

Economic Base. Knowledge about the economy of a jurisdiction will provide valuable insights about the existing and future generators of solid wastes, competition for public funds, and the ability of the jurisdiction to provide increasing revenues as demands for expenditures grow. Factors that should be examined include: industrial composition, employment groups, family income, retail trade, trade area, number of retail establishments, import-export (local and regional), tax base (assessed valuation), tax rates, and debt limitations.

Much of this data will be available from planning commissions, economic development departments, chambers of commerce, banks, universities, and U.S. Bureau of the Census in report form and complete with analysis. In some cases further collection and analysis of economic data will be required. Raw data is often available from the same agencies as those that prepare reports indicated previously.

Land Use Characteristics. The estimation of the total quantities of solid wastes generated within the State may be a difficult process in view of the scarcity of good data on collection and disposal quantities. Municipal collections frequently account for only a part--sometimes a very small part--of the solid wastes generated in the community. Substantial portions of industrial wastes are self-disposed of by industry members and are usually not counted. Uncontrolled dumping and open burning, where practiced, lead to further gaps in knowledge about waste quantities.

One way to estimate waste quantities is to use detailed information on varying land uses. For example, industrial waste production differs from that of residential and commercial areas, and waste production varies from one industry to another. Information is generally available in the State on present and future land uses based on land use plans and zoning. By relating generation rates to detailed land uses, reasonable waste projections can be made for planning purposes.

The detail of land use classes surveyed and mapped will depend upon the requirements of the jurisdictions. At least three basic classifications should be recorded: residential, commercial, and industrial. All zoning ordinances were originally based upon these three basis classifications. Further classifications might be desired. For example: residential may be single-family, two-family, or multi-family. Commercial classification may be central business district, shopping center, or highway strip. Industrial may be light, medium, or heavy. Of course, further breakdown in classification may be needed.

If land use data and maps are not available from planning offices, maps should be prepared showing the land use classification of each lot, tract, or parcel. Various colors or patterns can be used to designate land uses.

Future Conditions (Projections, Section V)

To determine where, to what extent, and at what level of persistence these conditions will prevail during the period of the plan, there must be analysis of existing conditions in a future context. This requires forecasting, the importance of which cannot be overemphasized. Correct forecasts identify problems before they occur, permitting predetermined solutions. This is one of the keys to successful planning. Lack of forecasts, or worse, wrong forecasts, allows problems to appear without warning, or solutions to be ready for the wrong problems. Statistically correct procedures are important in making forecasts. Methodology should, however, be tempered with good judgment. A forecast might be statistically correct, but does it appear reasonable under the circumstances?

When making forecasts, as well as when presenting the forecast data, it is often helpful to use working forms or tables, thus presenting comparisons and trends and revealing similarities or differences (Figures 2 and 3). Such forms for forecasting may be used eventually as tables in a plan document. Similar methods should be used for other data forecast during the planning process.

SAMPLE FORM TO FORECAST REQUIREMENTS FOR PERSONNEL

Solid Waste Management
State of _____

Classification	Existing number (year)	Future number (year)	Jurisdictional location
Management	x	x	State--Local
Administrative	x	x	State--Local
Engineers	x	x	State--Local
Sanitarians	x	x	State--Local
Other professionals	x	x	State--Local
Enforcement officials	x	x	State--Local
Licensing officials	x	x	State--Local
Heavy-equipment operators	x	x	Local
Incinerator operators	x	x	Local
Transfer station operators	x	x	Local
Packer truck operators	x	x	Local
Other collection personnel	x	x	Local
Street cleaning personnel	x	x	Local

Figure 2. In manpower planning, this form can be useful by organizing position classifications according to current and future needs.

SAMPLE FORM TO FORECAST REQUIREMENTS FOR SANITARY LANDFILL ACREAGE

Solid Waste Management
State of _____

County/Region	Current population (year)	Forecast population (year)	Current per capita generation (year)	Forecast per capita generation (year)	Tons generated Current/forecast	Estimated acre-ft fill space needed Current/forecast

Figure 3. This form can be helpful in organizing data and making calculations for sub-State planning where sanitary landfill capacities are important.

Illustrations can be of considerable aid to data presentation. Relatively simple charts, graphs, and tables are suggested for this purpose (Figure 4). It makes little sense to complicate graphic presentations when their basic purpose is to clearly convey information.

Objectives (Section VI)

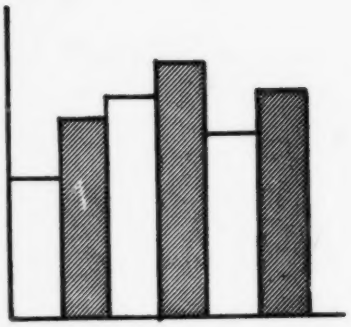
The overall mission of a State solid waste management plan is to solve the various problems connected with solid waste in the State. Each State implicitly or explicitly adopted this mission before beginning any planning. Indeed, the main reason for a State developing a plan at all is its desire to achieve this basic mission.

Detailed objectives will emerge as a natural outgrowth of problem definition while data is collected and analyzed during the early stages of the planning process. Objectives and solutions for solid waste problems are to be achieved through implementation of the plan. Objectives should be carefully selected and planning directed accordingly. As a formalized procedure, selection of objectives might proceed by examining each significant solid waste problem discovered in the analysis of existing data. The problem's relevance for the future should be given along with a definitive statement of the objective and proposed solutions. These solutions require implementation of a plan. The following examples illustrate the procedure.

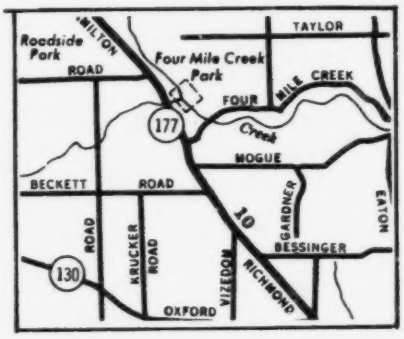
Problem discovered through analysis of the data (Example A). In 85 percent of the State's communities of 2,500 and less, the predominant collection vehicle is an open dump-type truck. Objective. To provide

USEFUL GRAPHIC DEVICES

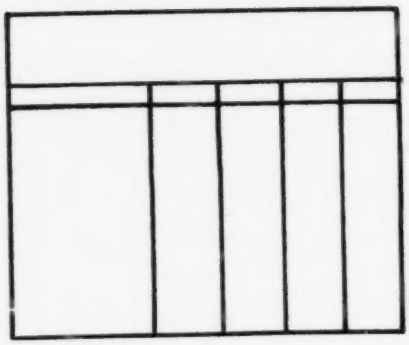
Curve



Histogram

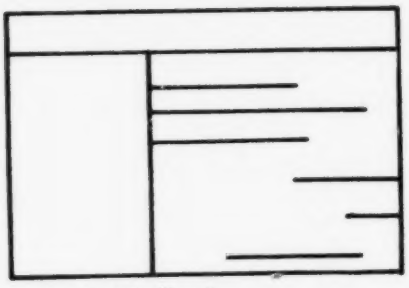


Map



Table

Pie Chart



Gantt Chart

Figure 4. Simple graphic devices are useful in depicting and conveying information clearly and quickly.

acceptable collection vehicles in communities of 2,500-and-less population. Recommendation for Solution. Provide for health regulation which specifies acceptable collection vehicles to apply statewide to all solid waste management systems becoming effective July 1, 1971.

Public attitude discovered through analysis of data (Example B). Most of the State's citizens are unaware of the need for solid waste disposal facilities. Objective. To better inform the public about the solid waste disposal requirements and the current efforts to provide necessary facilities. Recommendation for Solution. Develop annual public relations programs covering the next five years which consist of news releases, newsletters, and a speaker's bureau to disseminate information about the problems of solid waste and the measures being taken to solve these problems.

Any objective developed should be directly related to a specific recommendation for intended action in the plan. In developing objectives it might be useful to actually tabulate problems, suggested objectives, and possible planned action on a working form (Figure 5). The form takes the approach used in Examples A and B and provides space for inserting specific implementing actions designed to achieve objectives. The Recommendations section or Plan will contain the specific actions.

Recommendations for Solution (Section VII)

This section of a plan report is essentially the plan itself. A State's intentions for achieving objectives that will help solve its solid waste management problems should be specifically stated and

SAMPLE WORKING FORM TO DEVELOP OBJECTIVES

Planning Work Form

(1) Problem Definition:

(2) Objective:

(3) Alternative Solutions:

(a)

(b)

(c)

(4) Recommended Planned Solution:

Figure 5. It is helpful to systematically relate problems to objectives and solutions if tabulated on a form like this.

elaborated here. As suggested, a working form can be used advantageously in developing this section of the planning report, since recommended planned solutions to solid waste management problems have already been related to objectives. In addition, however, the recommended solution should be considerably elaborated with a view to designating responsibilities, priorities, timing, locations, estimated costs, and the problems that will be solved.

Planned action could be organized on a working form (Figure 6). Such a form would simply structure and elaborate the recommended planned solutions stated in an objectives development planning workform (Figure 5).

Implementation (Section VIII)

Implementation of a plan is the process of activating the recommendations for solution. Descriptions of possible implementing action are included in Part Five of this document.

Appendices. Supporting data, references, tables, maps, and explanation of methodologies, should be placed in appropriate appendices in order to avoid a cluttered plan text. References to this material can be made in the text using notations or footnotes. This enhances readability of the text and avoids the possibility that important recommendations may be overlooked. In some States, both the plan text and supporting data might be sufficiently voluminous to justify two separate report volumes. One would contain data while the other would serve as the plan text containing recommendations, priority listings, and schedules.

SAMPLE PLANNING WORKFORM FOR PLAN DEVELOPMENT

Statement of Problem:

Recommended Planned Solution:

Summary of Planned Action

Timing (year)	Priority	Jurisdictional responsibility	Location	Estimated costs	Related problems solved

Figure 6. This form permits organization of planning proposals geared to specific problem solution within a context of time, responsibility, money, and evaluation.

PART FOUR: OPERATIONAL PLANNING TECHNIQUES

Described in this section are management techniques and procedures applicable to both local and regional solid waste agencies. These should be included in the State plan. Those States (and interstate agencies) that directly exercise local and regional planning responsibilities should plan to install these management techniques in their areas of jurisdiction. States that exercise only advisory planning responsibility for local areas should include a discussion of these techniques in order to guide local operating agencies in their planning and implementation activities.

Organizing

Ultimate success or failure of any solid waste management system will be realized at the operational level. Day-to-day implementation of the available technology and public service objectives will require an efficient and effective basic organization. The organization, in order to be effective, must be staffed by qualified personnel and provided with adequate resources. An organization must be not only capable of responding to the needs of solid waste management, but must have the strength and flexibility to initiate the changes that will serve to improve the management system.

There are four crucial points in developing an organization to manage any endeavor: (1) The organization should be designed to

achieve planned objectives; (2) it should have authority and responsibility appropriate to the task at hand; (3) it should fit both legally and logically into the overall jurisdiction of which it is a part; (4) it must be staffed with adequate numbers of qualified personnel.

Advisory Committees

Advisory committees have good potential for guiding and supporting a solid waste management planning and implementation program at the State, local, or regional levels. The specific purposes of the advisory committee should be determined and criteria then established for selecting members. An advisory committee might be formed to provide, for example, only technical advice to the solid waste management planning agency. If this is the purpose, then it is important that advisory committee members be capable of providing technical expertise in various aspects of solid waste management. However, an advisory committee with broader responsibilities might serve the following functions: (1) to provide technical insight; (2) to assure adequate coordination with other public agencies, such as those concerned with air, water, and State and regional planning; (3) to offer policy direction.

If possible, advisory committees should be limited to presentation of recommendations and resolutions of approval. Disagreements should be resolved or modified during sessions of the committee. Final decisions ideally should reside with the responsible solid waste management agency.

Manpower Planning

A manager of a solid waste management system, as with any operation requiring large numbers of personnel, will find manpower needs and management of personnel one of his largest concerns. In order to reduce uncertainties about manpower needs for the future and to provide continuity in the solid waste management system, a manpower plan should be prepared. A plan for manpower need be nothing more than a listing of all position classifications in the system, existing personnel in each classification, an estimate of personnel required for these positions during a future period, 3, 5, and 10 years hence, and estimated personnel costs for these periods. Attrition and retirements should be anticipated by determining ages of employees and application of normal turnover rates. Planning will permit provision of adequate numbers and kinds of personnel as well as chart paths of promotion of personnel to insure continuity of the organization.

Labor Relations

An immediate challenge in many systems for solid waste management will be the insistence of employees to assert employee rights by means of work stoppages. Therefore, mechanisms should be adopted to help minimize stoppages and to permit continued service to the public. Methods have been available and successful for many years in the private sector. These are: (1) acceptance and legal designation of a bargaining agent and unit; (2) negotiation of a collective agreement or contract; (3) grievance and arbitration procedures. Grievance procedures should be designed to resolve issues early in order to avoid entering into

arbitration. Arbitration, however, should be used in public labor relations whenever possible in order to avoid work stoppages. The public jurisdiction's collective bargaining team should include representatives from the jurisdiction's legislative body, such as the city council, or county commissioners, personnel office, legal department, chief executive's office, and representatives from the department in which the bargaining unit is employed. The collective bargaining team should be aware of and give special attention to presenting the jurisdiction's objectives in the contract, determining key policies on management rights (public interest), work rules, job security, and relationships to civil service or merit system provisions.

Maintaining Plan Currency

A scheduling matrix can be a useful aid in scheduling of the State's planned activities over a broad time span (Figure 7). Each year the intended activities would be updated by a year. For example, when 1970-71 becomes the operating year, the end of the Long Term period would move from 1989 to 1990. With such a matrix the plan remains current while continuing to provide a long-term guide. In actual practice a State's scheduling matrix might be several pages long and supported by explanatory text. In fact, it would become another summary of the plan itself while providing the vehicle for plan revision.

Community Evaluations

In many States continuous planning activity will include the development of regional and local plans for solid waste management.

SAMPLE MATRIX FOR STATE SOLID WASTE PLANNING PROGRAMS

Implementation	Operating Year								
	Short-term (5 years)						Long-term (20 years)		
	1969-70	1970-71	1971-72	1972-73	1973-74	1974-75	1975-80	1980-85	1985-89
Survey—State solid waste conditions	x								
Survey—refinement and analysis		x							
Plan formulation		x	x						
Plan revisions				x		x	x	x	x
Survey data revisions			x		x				
Develop State legislation			x						
Develop State regulations				x					
Develop local model ordinances				x					
Enforcement program					x	x	x	x	x
Technical assistance				x	x	x	x	x	x
Develop local and regional plans				x	x	x			
State training program				x	x	x	x	x	x
Statewide public information	x	x	x	x	x	x	x	x	x

Figure 7. This form is designed for scheduling planned action during specific time spans. A total implementation program to be updated quite easily by simply evaluating the need for an activity and indicating its new date for action. Each year the operating year is moved ahead by a one year span.

Procedurally, community plans have been formulated very much as are State plans. Basic data is collected and analyzed, problems defined, objectives stated, and suggested or planned solutions stipulated in order to achieve objectives. In developing community plans it might be helpful to organize a community planning profile. The workform (Figure 8) will aid in organizing the basic problem-objective-solution procedure for solid waste planning at the regional and local level. Of course, all of the considerations for community planning are not provided on this form. Other things, such as population, economics, land use, finance, administration and organization, manpower, zoning, comprehensive local plan provisions, and traffic patterns will need to be examined as well.

Management Techniques

A number of quantitative management techniques are applicable to the field of solid waste planning and management. These include statistical methodologies which are appropriate for analysis and forecasting of solid waste generation rates, population, economic conditions, and future land uses. Other techniques aid in scheduling, budgeting, and evaluation. For example, the techniques of PERT/CPM and the methodologies of PPBS and operations research are receiving increasing use among planners and managers in government and private industry.

Program Evaluation and Review Technique and Critical Path Method (PERT/CPM). These planning and control techniques lend themselves best to project planning and are accomplished through time-event network

SAMPLE FORM FOR COMMUNITY PLANNING PROFILE

(1) Name of Community _____

(2) Region of State _____

(3) Planning Jurisdiction _____

(4) Relevant Community Data (derived from specific data print-out for the community from the National Survey of Community Solid Waste Practices)

(5) Significant Problems

a. types

b. locations

c. extent and persistence

d. control difficulties

(6) Future Significance of Problems

(7) Objectives for Solution

(8) Specific Recommendations for Solution

a. facilities that will be provided

b. timing and priorities

c. location

d. responsibility

e. estimated costs--operating and capital

f. problems that will be solved

Figure 8. Although not providing indication of all community planning considerations, this form does help organize solid waste aspects into the probjem-objective-solution procedure familiar to users of this guideline.

analysis. The initial development of a plan for solid waste management could be scheduled by PERT/CPM. In order to apply PERT/CPM, three basic questions about the project should be asked: (1) What tasks must be finished before this task can begin; (2) What tasks can be accomplished concurrently; (3) What tasks can begin after another task is partially complete?

Planning-Programming-Budgeting-System (PPBS). This is a management tool that provides for a method of rational decision-making in government. A characteristic of PPBS is that output measurement of a given unit of effort is required (e.g., crimes prevented because of added policemen, incidence of disease reduced because of immunization programs, or reduction of open dumps because of added manpower units for inspection and enforcement, etc.) rather than just input (i.e., money, manpower, and time). The basic elements of PPBS include: (1) consideration of future implications of any programmed effort; (2) identification of a governmental unit's objectives and relating all activities, regardless of organizational responsibility to these objectives; (3) consideration of all pertinent costs (operating and capital); (4) systematic analysis of alternatives for reaching objectives. This would include estimation of total cost of each alternative as well as resulting major cost and benefit tradeoffs involved with the alternatives.

In States installing PPBS, the planning and implementation activities of the solid waste management agency should be designed to relate to this system. Use of the planning procedures presented in these guidelines, especially those aspects concerned with setting objectives, achieving

those objectives, and measuring results in problems solved, will permit the State plan to be readily adapted in PPBS.

Operations Research (OR). Basically, operations research is the application of the scientific method to the study of possible alternatives for the purpose of developing a quantitative basis for achieving an optimal solution for the problems of functional and operating units in terms of objectives. This definition would quite adequately fit the planning process outlined in the present guidelines, since planning and operations research employ similar analytical methods. Operations research permits management to arrive at the best decisions and solutions to operating problems. At the local and regional operating levels, operations research can, for example, make possible the design of an optimal collection network, or determine which combination of several alternative locations for proposed transfer stations would be best. Furthermore, the techniques of operations research have proven quite useful in the development of comprehensive solid waste management plans since OR is interdisciplinary and oriented to a total system.

PART FIVE: IMPLEMENTATION

Although closely related to planning, implementation is a distinct step marking the apparent end of planning and the beginning of action. In actual practice, planning never ends, while action frequently becomes necessary before the comprehensive plan is first completed. In these guidelines, the concept of implementation will be confined to program-type activities in contrast to the steps and procedures already characterized as part of the planning process and described in the Basic Planning Model.

Each State will share in making an appropriate distinction between planning and program activities based in part upon the following considerations: (1) the degree to which the State is able to conform to the planning process as described by these guidelines and the basic planning model (Figure 1); (2) characteristics of the State's solid waste management system; (3) duties and responsibilities of the designated State solid waste planning agency; (4) the scope and depth of a State's planning activity as conducted under the solid waste planning grant program and as actually practiced; (5) the depth of detail to which the activity is undertaken, as measured by legislative activities, advisory and training service contacts, evaluations and inspections conducted, research activity engaged in, and degree of responsibility

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for physical plant. Activities considered critical to the implementation of a State solid waste management plan would include statewide legislation, technical assistance, public information program, training activities, coordination with related activities, encouragement of new and improved technology, acquisition of facilities, and personnel recruitment and selection.

Statewide Legislation. Principal implementing devices for solid waste management at the State, regional, and local levels will be enabling legislation by the State followed by the establishment of administrative rules and regulations and local ordinances. The steps leading to the development of effective legislation might be as follows: (1) The first step, a review and evaluation of existing State legislation, both enabling and regulatory, has already taken place in the collection and analysis of data as part of the planning process. (2) An assessment of the adequacy of existing legislation and a determination of legislative needs should also have occurred in the planning process. This step is predicated on the planning objectives with consideration for present solid waste handling practices, future solid waste handling requirements, established goals and priorities, resources available for complying with proposed regulations and standards, and enforcement resources. (3) To draft new legislation and administrative regulations (if required) is the next step. Consideration should be given to the applicability of the following: Federal recommendations; recommendations of (and cooperation with) local and regional agencies; stated purpose of the legislation; definition of terms; prohibitions and requirements; right

of entry, inspections, and enforcement; penalties; appeals; authority to plan for solid waste management; authority to approve new solid waste management systems; authority to set administrative rules and regulations; possible authority to tax and expend public funds. Specific technological procedures and operating methods should not be included in legislation since difficult-to-procure amendments to the law would be required for even simple changes to take advantage of improved technology. Instead, administrative rules and regulations permitted by the legislation should be used for regulating specific operations of solid waste management. (4) Take necessary steps to assist in the passage of recommended legislation. This might include supplying of informational material and attendance at public hearings. (5) Plan and/or implement a program of enforcement. (6) Provide model solid waste management ordinances for regional and local jurisdictions. The State solid waste planning agency should consider this function as part of its advisory or regulatory function. (7) Promulgation of legislation, rules and regulations, and established standards through both official and popular media.

Technical Assistance. A major implementing activity of the State solid waste agency will be to assist all agencies and groups concerned with solid waste handling within the State, whether they be urban, rural, public, private, industrial, commercial, or agricultural. Assistance to local and regional agencies will be oriented toward the development and conduct of solid waste management plans and systems. Assistance might include the following activities.

Design and Operation Rating Procedures and Recommendations. The State should provide local and regional agencies with guidelines on rating procedures and recommendations for the design and operation of sanitary landfills, incinerators, composting plants, auto salvage lots, transfer systems, solid waste storage, and collection systems. Performance standards will be an important tool in achieving this objective.

Evaluating Alternative Systems. The State should provide agencies with assistance in evaluating the choosing between alternative types of collection and disposal systems.

Salvage and Reclamation Methods, Locations of Storage and Use, and Materials Should be Examined. The State should encourage efforts and aid private industry and the secondary materials industry to develop methods and improve the economics of utilizing junked vehicles and recycling of industrial solid wastes.

Legislation. Assistance should be provided for the development, passage, and implementation or enforcement of local and regional legislation. Such assistance might take the form of model ordinances, recommended standards and regulations, and public information.

Management, Administrative, and Fiscal Assistance. The State agency should help to develop and improve management and administration capabilities at every level of government. It should propose methods and priorities for obtaining financial assistance. The agency may encourage the use of standardized cost accounting systems and the adoption of capital improvement programs.

Training. The State agency may wish to determine the status of technical skills currently available in the conduct of solid wastes management programs and to assess the need for increased technical competencies to fulfill future needs. Pre-service training of students in solid waste management might offer an approach for developing needed knowledge and skills. Planning activities might include the development of guidelines for providing technical and in-service training for solid waste handling personnel and the development and application of standards, or certification, for such personnel. University extension or continuation education facilities might be used for this purpose.

Inspection and Evaluation. The State agency might be called upon to inspect, evaluate, and make recommendations for the improvement of existing solid waste handling operations. This activity should be conducted on a periodic basis.

Regional Plans. Where advantageous, the State agency should encourage the development of regional or areawide plans (e.g., county or metropolitan areas). Existing urban and regional planning jurisdictions should be examined as possible vehicles for this purpose. The State agency can serve a coordinating function by bringing together the various jurisdictions involved in the planning effort.

Public Information. The State agency should assist local and regional agencies in the development of effective public information-public education programs.

Reservation of Future Disposal Sites. The State agency should encourage local and regional planning efforts to provide for the early reservation of land for future disposal sites and facilities.

Plan Development, Review, and Approval. In addition to providing assistance for the development of local and regional solid wastes plans, the State agency should develop a program for the review and approval of all local and regional plans developed under other funding arrangements. Plans for major solid waste disposal facilities and sites should also be reviewed.

In addition to the assistance provided to local and regional agencies, the State agency must give due consideration to problems not amenable to solutions on a local or regional level. Many of the problems of industry, mining, agriculture, and commerce fall into this category.

Statewide Public Information Program. In addition to assisting local and regional agencies in the development of their public information programs, the State agency should develop and initiate a statewide public information/education program. The following activities might be included: (1) assembling information on solid waste practices and environmental conditions; (2) obtaining and developing informational materials, pamphlets, books, films, and monographs; (3) providing for information dissemination by newspaper, radio, and TV; (4) schedule talks and lectures.

Statewide Training Activities. Although solid waste training should be oriented toward local and regional solid waste handling agencies, a statewide training program should also be developed and might include the following activities: (1) encouraging management and technical training in colleges and universities (solid waste

courses could be included in undergraduate, graduate, and extension curricula); (2) arranging for field courses and demonstrations (such as visiting a sanitary landfill in operation) for public officials, operating personnel, and other interested parties.

Coordination with Related Activities. Solid waste planning should be coordinated with activities of other related agencies. In most jurisdictions other operating or planning agencies may have interests that would overlap with those related to the development or implementation of a planning program for solid waste disposal. These might include official agencies such as the State planning agency, agriculture department, highway department, industrial commission, air and water pollution control agencies, as well as a variety of local or unofficial agencies or groups. A major objective of the grant support authorized by the 1965 Solid Waste Disposal Act is the coordination of solid waste planning with other planning. Thus, the solid waste agency should not only list the agencies with which planning will be coordinated but also indicate the specific ways in which coordination will be assured. Coordination is specifically required with air and water pollution control planning and with planning activities supported with funds provided by Section 701 of the Housing Act of 1954, as amended. Other coordination may be required under Section 204, Demonstration Cities and Metropolitan Development Act of 1966. (See Bureau of the Budget circular A-95, September 30, 1969.) Comprehensive Health Planning (PL 89-749) offers another opportunity for coordinative effort for mutual solution of areawide problems. Coordination of solid waste

disposal planning with the activities of other agencies within the jurisdiction should be of considerable value to the State solid waste disposal planning agency, not only in permitting the development of regional and jurisdiction-wide plans but also in providing mutual access to planning data and joint promotion of comprehensive plans.

The State solid waste planning agency should strive for complete cooperation and coordination in the development and implementation of all local, regional (SMSA, county, COG, and metropolitan-authority), and State planning efforts. Although emphasis is needed on developing regional or areawide plans, local plans should not be neglected. Rather, they should be developed for inclusion in the larger regional plan. Certain elements such as standards, legislation, and regulations should be uniform within the region and State. In order to ensure the effective coordination of all planning efforts throughout the State, the solid waste planning agency should develop and implement the State plan with the full support, knowledge, and assistance of local and regional jurisdictions. Indeed, many of the activities carried out by the State solid waste planning agency will require the support and assistance of local and regional agencies. An example of this might be the testing of a regional sanitary landfill coupled with the use of local transfer stations. Such an activity would be apt to require interjurisdictional management and financial support. Development of plans for large jurisdictions may require assistance from the State solid waste planning

agency in the form of special studies, the development and testing of alternative solutions, and legal and financial reviews.

Encouragement of New and Improved Technology. The State agency for solid waste management should encourage the research, development, demonstration, and utilization of new and improved solid waste management technology. This might include: (1) encouraging the development of regional or areawide solid waste plans; (2) encouraging the demonstration of new and improved technology, both "hardware" and "software"; (3) encouraging the application of systems analysis and operations research to solid waste management systems; (4) providing for the distribution of information on new research and technology by means of available information media. Consideration might be given to the development of a statewide newsletter for disseminating this information.

Acquisition of Facilities. Implementation of a solid waste management plan will at some point require acquisition and development of facilities, which might include land, buildings, trucks, earthmoving and other equipment. Estimates for equipment needs in the plan will aid in acquiring the necessary equipment at the time of implementation. The agency accepting responsibility for implementation must also arrange for financing of facilities. Provision should be made for both capital and operating expenditures.

Personnel Recruitment and Selection. Part of implementing solid waste management plans is the recruitment and selection of personnel. The provision of personnel can be guided by needs forecast in the plan. Adequate methods of selection to assure qualified personnel should be

used. After hiring, modern methods of personnel management and labor relations should be applied.

Continuation of a Statewide Solid Waste Planning Program. A significant part of the State solid waste management plan should be aimed toward the development of a continuing planning program for furthering effective solid waste management throughout the State. Under this program there might be the following activities: (1) periodic review and updating of State, regional, and local plans. On the State level this might require the development of an inventory system to regularly update the data and evaluate the status of current solid waste management practices. It might also include the development of some type of model to periodically update forecasts of future solid waste handling requirements. At the local and regional levels, State activities could probably be directed toward assistance in updating local and regional solid waste plans. (2) Periodic assessment of the implementation progress of State, local, and regional plans. This activity would require the development of techniques for measuring progress toward goals. (3) Periodic review of adoption and enforcement activities of State, regional, and local legislation and standards. This will require an enforcement activities information system as well as a legislative reporting service. (4) Continuing technical, financial, and legal consultation, guidance, and assistance to local and regional solid waste management agencies. This service could also extend to industry, agriculture, and commerce.

PART SIX: DEFINITIONS

Alternatives, two or more possible solutions to solid waste management problems.

Basic Planning Model, a depiction of the procedures and dynamics of the actual planning process. See Basic Planning Model diagram, page 4.

Councils of Governments (COG's), intergovernmental organizations of local governments formed for the purpose of planning and sometimes review of Federal grant expenditures.

Feedback, data representing reactions, results, and evaluations reentering the planning process which will allow for plan modifications if needed.

Implementation, the process of activating the plan to achieve solutions to solid waste management problems.

National Survey of Community Solid Waste Practices, the extensive national survey conducted by solid waste planning grantees and the Bureau of Solid Waste Management concerning solid waste practices and conditions.

Objectives, stated and specific goals which if achieved, solve specific solid waste management problems.

Operating Agencies, refer to agencies which have the responsibility and authority for actual operation of a solid waste management system, including purchase and operation of equipment, and collection, transportation, and disposal of solid wastes.

OR, Operations Research. See page 37.

PERT/CPM, Program Evaluation and Review Technique/Critical Path Method. See page 34.

Planning Process, see page 1.

PPBS, Planning-Programming-Budgeting-System. See page 36.

Standard Metropolitan Statistical Area (SMSA), is a U.S. Bureau of the Census designation for the collection and analysis of urban data. SMSA's are areawide in scope and use county boundaries.